

REMARKS

In response to the Examiner's Action mailed on April 26, 2000, claims 1 to 21 are amended. The applicant hereby respectfully requests that the patent application be reconsidered.

An item by item response to Examiner's objections or rejections is provided in the followings:

1-2 Claims Rejection under 35 USC § 103(b)

The Examiner rejects claims 1-6 under 35 USC§103(b) as being unpatentable over Mok (5,703,753 dated 12/30/97), Inoue (5,909,010) and Lin (6,002,178 dated 12/14/99). According to the Examiner Mok shows the method as claimed in Figs. 1-12 with corresponding text. Mok discloses a mounting assembly for a multiple chip module 13 or other circuit module, which includes a printed wiring board 11 having a surface including an array of board contacts 23, a thermally conductive base 15, a first substrate, a second substrate, conductors 21 connecting the interconnect structure 12, a connector between the board and the second substrate, a heat spreader assembly 14 and a fastener which fastens the thermally conductive base 15 to the board and to the hear spreader assembly 14. However, Mok does not show a chip size package.

Otsuka discloses a chip size package constituted by a chip 2 on which an integrated circuit is formed and plated bumps 2a are formed at terminal portions of the integrated circuit. A flexible two-layered printed circuit board 4 having inter-level conductive bumps 4c for electrically connecting metal patterns 4a formed on the two surfaces of the flexible board and an anisotropic conductive film 6 for electrically connecting the plated bumps arranged on the chip.

Inoue discloses a CSP (chip size package) including a semiconductor IC chip having input/output terminals 71 along its edges. A small size substrate 1 has a smaller contour than the chip and has a plurality of metal terminals 24 arranged along the edges of its bottom and

a plurality of metal bumps 12 arranged on its top in a lattice configuration.

Lin discloses a chip size package (CSP) ready multiple chip module (MCM) board having a top surface and a bottom surface for mounting and packaging a plurality of integrated circuit (IC) chips on the top surface.

According to the Examiner, it would have been obvious to one of ordinary skill in the art at the time the invention was made to have modified Mok to include s chip size package because of reasonable expectation of achieving the specific result of reducing the production costs without degrading product reliability.

In response to Examiner's rejection, claim 1 is amended to direct to an integrated multiple-substrate-on-chip-module (MSOCM) assembly. This CSP-ready MSOCM assembly includes:

- a) a chip-size package (CSP)-ready MSOCM board having a top surface and a bottom surface, said CSP-ready MSOCM board includes **a plurality of board bonding-wire windows opened in said MSOCM board** and said CSP-ready MSOCM board further includes a plurality of board-bonding-pads disposed on said top surface of said CSP-ready MSOCM board near said bonding-wire window;
- b) an adhesive layer disposed beneath said CSP-ready MSOCM board also having a plurality of adhesive-layer bonding wire windows corresponding to and aligned with said board bonding wire windows on said MSOCM board;
- c) a plurality of integrated circuit (IC) chips mounted onto said adhesive layer under said bottom surface of said CSP-ready MSOCM board with each of said IC chips provided with a plurality of chip bonding pads facing an open space defined by said board bonding-wire windows;
- d) a plurality of bonding wires disposed in said space defined by said board **bonding-wire windows** and adhesive-layer bonding-wire windows and **interconnected** between each of said chip bonding pads and a corresponding board bonding pad disposed on said top surface of said CSP-ready MSOCM board; and

- e) a CSP-ready land-grid array comprising a plurality of land-grid contact pads disposed on said top surface of said CSP-ready MSOCM board wherein said plurality of land-grid contact pads are arranged to have a standard CSP-footprint of said IC chips whereby each of said IC chips mounted onto said CSP-ready MSOCM board is provided to be separated into an individual CSP package.

The newly added limitation that the MSOCM assembly includes a CSP-ready MSOCM board that includes **a plurality of board bonding-wire windows opened in said MSOCM board** and a CSP-ready land grid array that further includes **a plurality of land-grid contact pads. The contact pads are arranged to have a standard CSP-footprint of the IC chips whereby each of the IC chips mounted onto the CSP-ready MSOCM board is provided to be separated into an individual CSP package**

Mok, Otsuka, Inoue, and Lin do not disclose such a CSP-ready MSOCM board that includes **a plurality of board bonding-wire windows opened in said MSOCM board**. A combination of these prior art patents would not be sufficient to motivate a person of ordinary skill in the art to device an MSOCM assembly as now directed by the amended claim 1. Claims 2 to 6 are dependent claims and would not be obvious over a combinations of all these prior art references. For the purpose of preventing mistakenly consider Mok's invention as having such bonding wire windows opened in the MSOCM board, two sheets of Mok's drawings are attached to show Figs. 1, 2, and 10 of Mok. Mok's basic configuration is a regular multiple chip wire-bonding structure with bonding wires bonded to the bonding pads disposed on the supporting substrate for the chip (more details are clearly shown in Fig. 10). There is no bonding wire windows opened in the board. A combination of Mok and all the cited prior art references would not be sufficient to make the amended claims 1 to 6 obvious when more careful examination is made. A non-obvious conclusion can be readily reached with careful considerations, even from a first impression of Mok's drawings there may be a mistakenly imagination that there are windows opened in the supporting substrate, but that is not what is disclosed in Mok's patent.

Based on a basic configuration of such multiple chip-on-silicon module assembly, claims 6 to 21 are also amended. In claim 6, a configuration of Fig. 1A is claimed that has a "platform for disposing the bonding pads. Specifically, claim 6 is amended to direct to a MSOCM assembly wherein:

each of said board bonding-wire windows opened in said CSP-ready MSOCM board above each of said IC chips further comprising a bigger opening near said top surface of said CSP-ready MSOCM board wherein an interface between said bigger opening and a smaller opening at a bottom portion of said board bonding-wire window providing a platform for disposing said board bonding-pads thereon.

None of the cited prior art references has such a configuration.

Claim 8 is amended to direct to a totally new MSOCM assembly that further includes

a liquid encapsulation filler filling each of said board bonding-wire windows; and

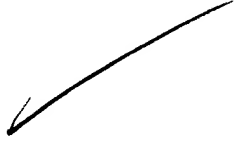
each of said board bonding-wire windows further comprising a liquid encapsulation dam disposed on said top surface of said CSP-ready MSOCM board surrounding each of said board bonding-wire [window] windows for keeping said liquid encapsulation filler from flowing outside of said liquid encapsulation dam.

None of the cited prior art references provides a liquid encapsulation as now directed by the amended claim 8.

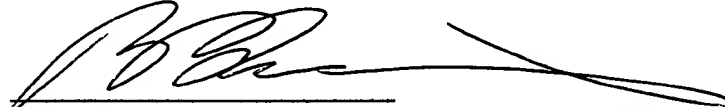
In addition to these amended claims, claims 9 to 21 are also amended to direct to novel and non-obvious MSOCM assemblies that has added limitations with configurations and assembly structures not disclosed or discussed in each of the cited prior art references. For these reasons, the Applicant would like to respectfully requests that the Examiner would remove the rejection under 35 USC§103 for these amended claims as these claims would be novel, non-obvious and allowable in view of these cited prior art references.

With the amended and the newly added claims, and the reasons provided above, the Applicants hereby respectfully urge that the Examiner would withdraw the 35 USC§ 103 rejections, such that the present application can be reconsidered and allowed.

Respectfully submitted
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By



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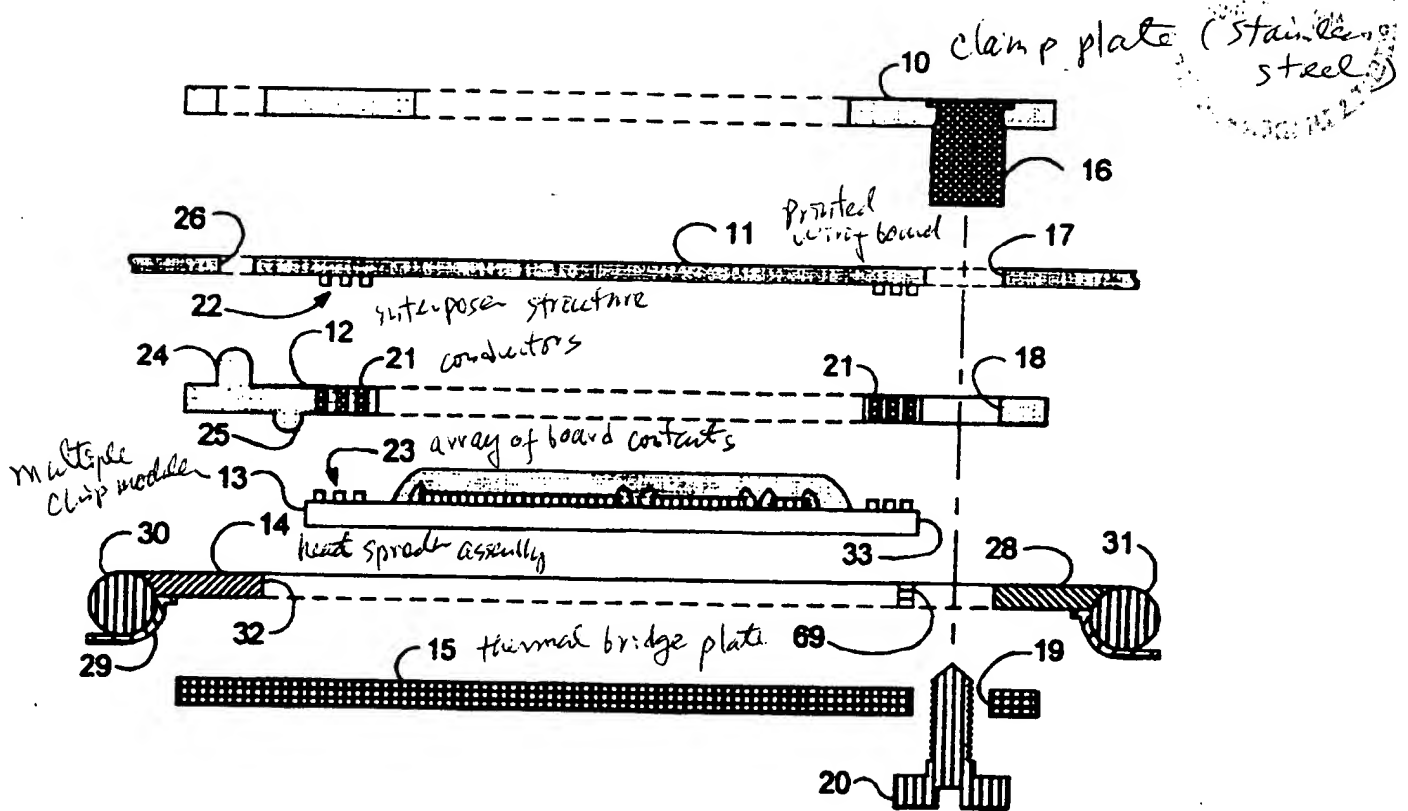


FIG. 1

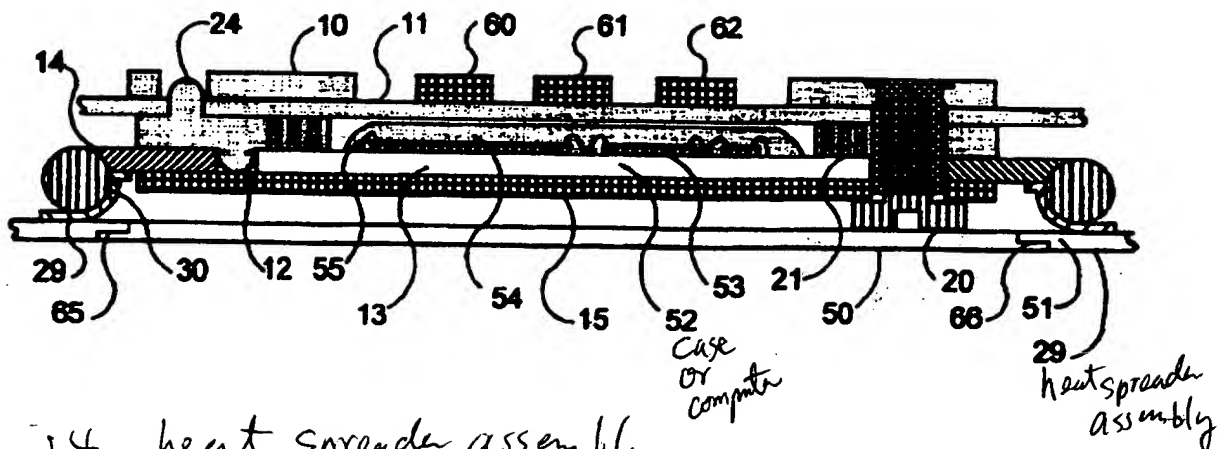


FIG. 2

14 heat spreader assembly
15: thermally conductive base
21: conductors
a first substrate
a second substrate

13 multiple chip module (or other circuit module)
11: printed wiring board
23: array of board contacts

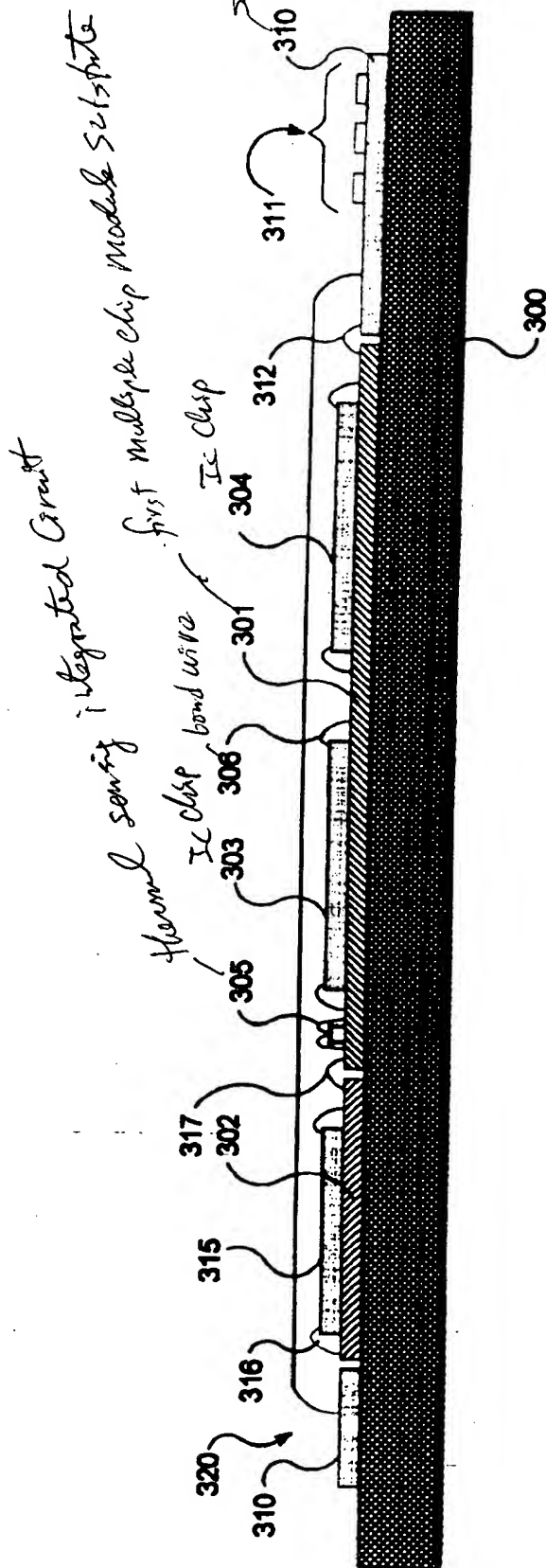


FIG. 10

Fig. 1A

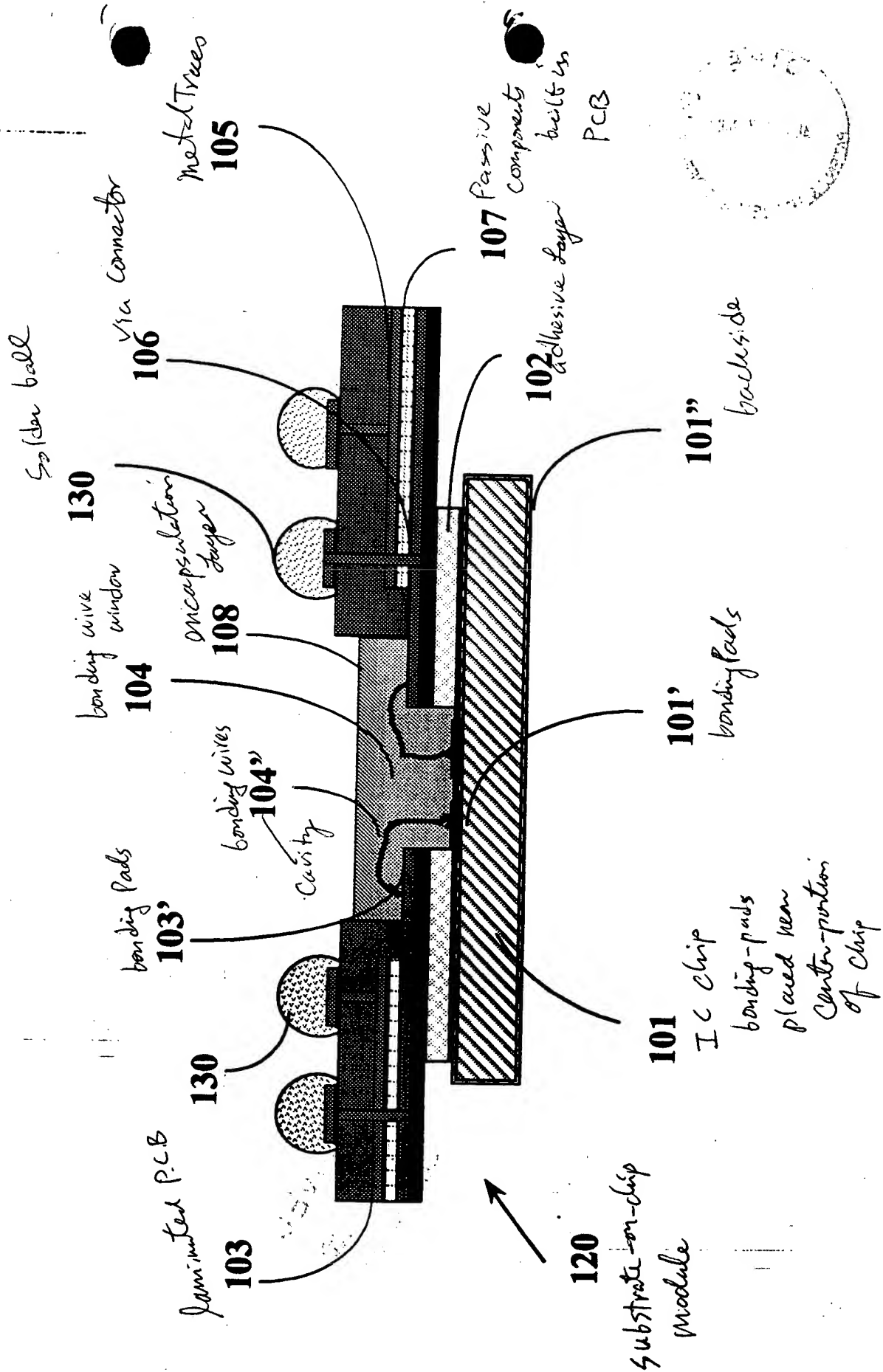
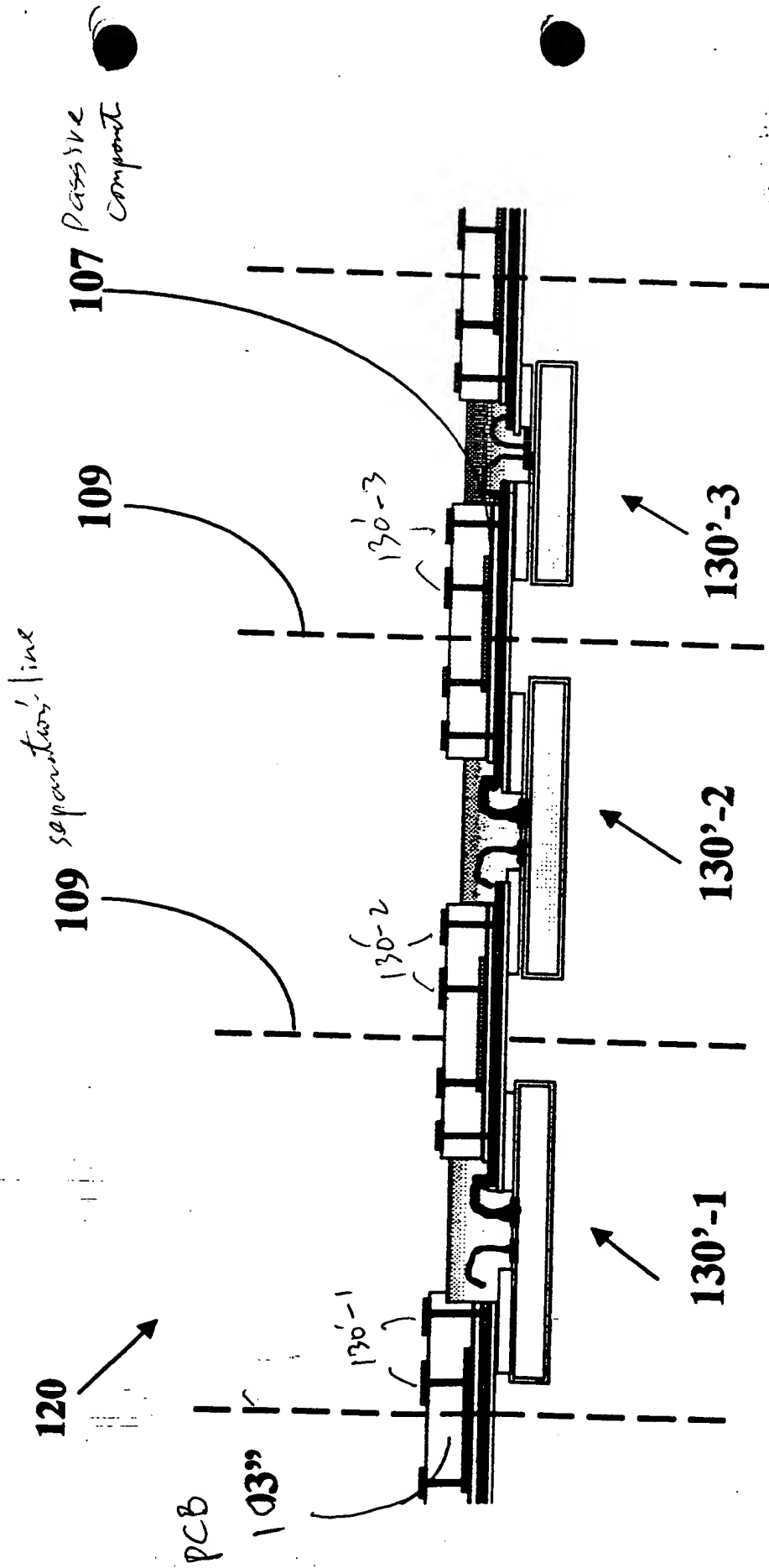


Fig.1B



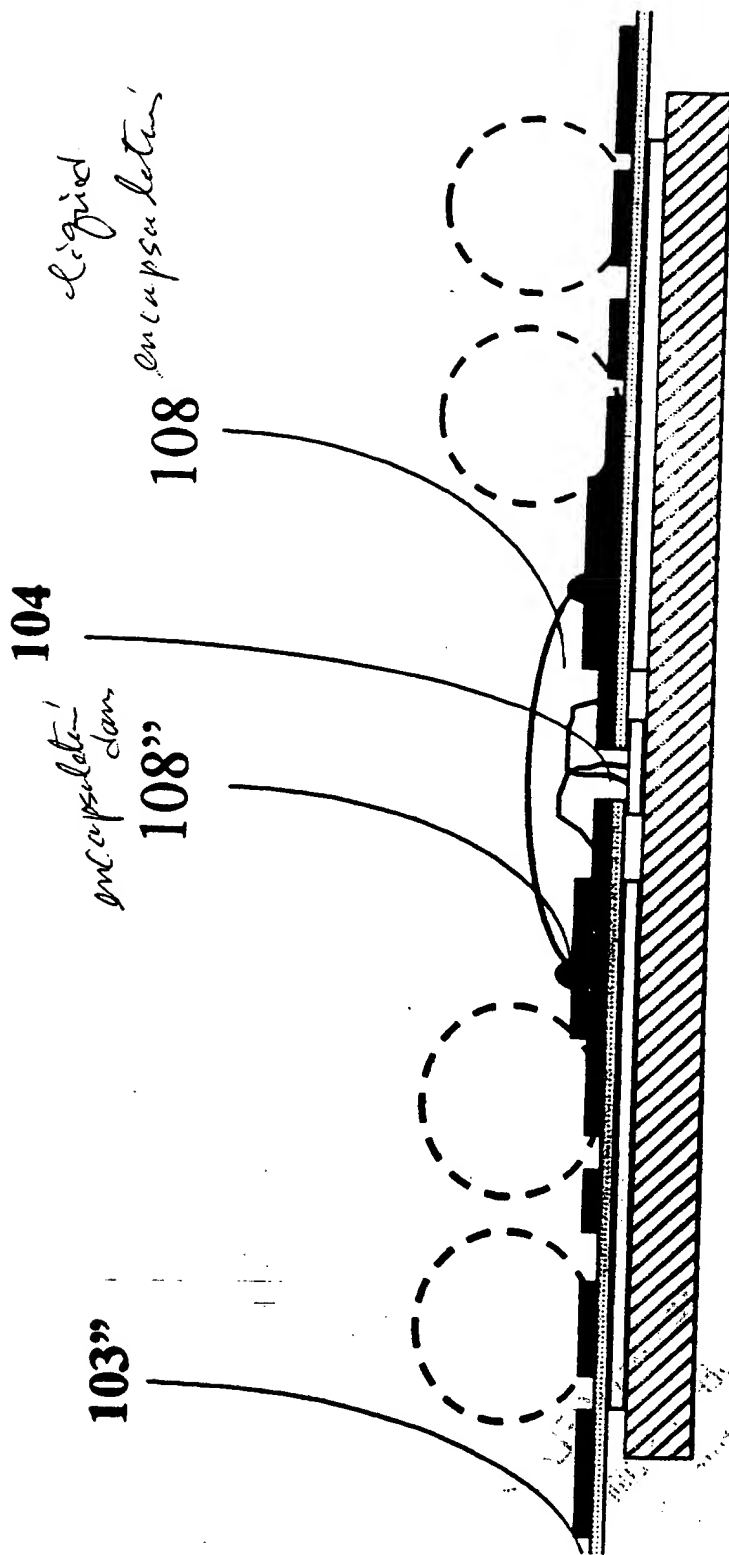


Fig. 1C



Fig. 1D

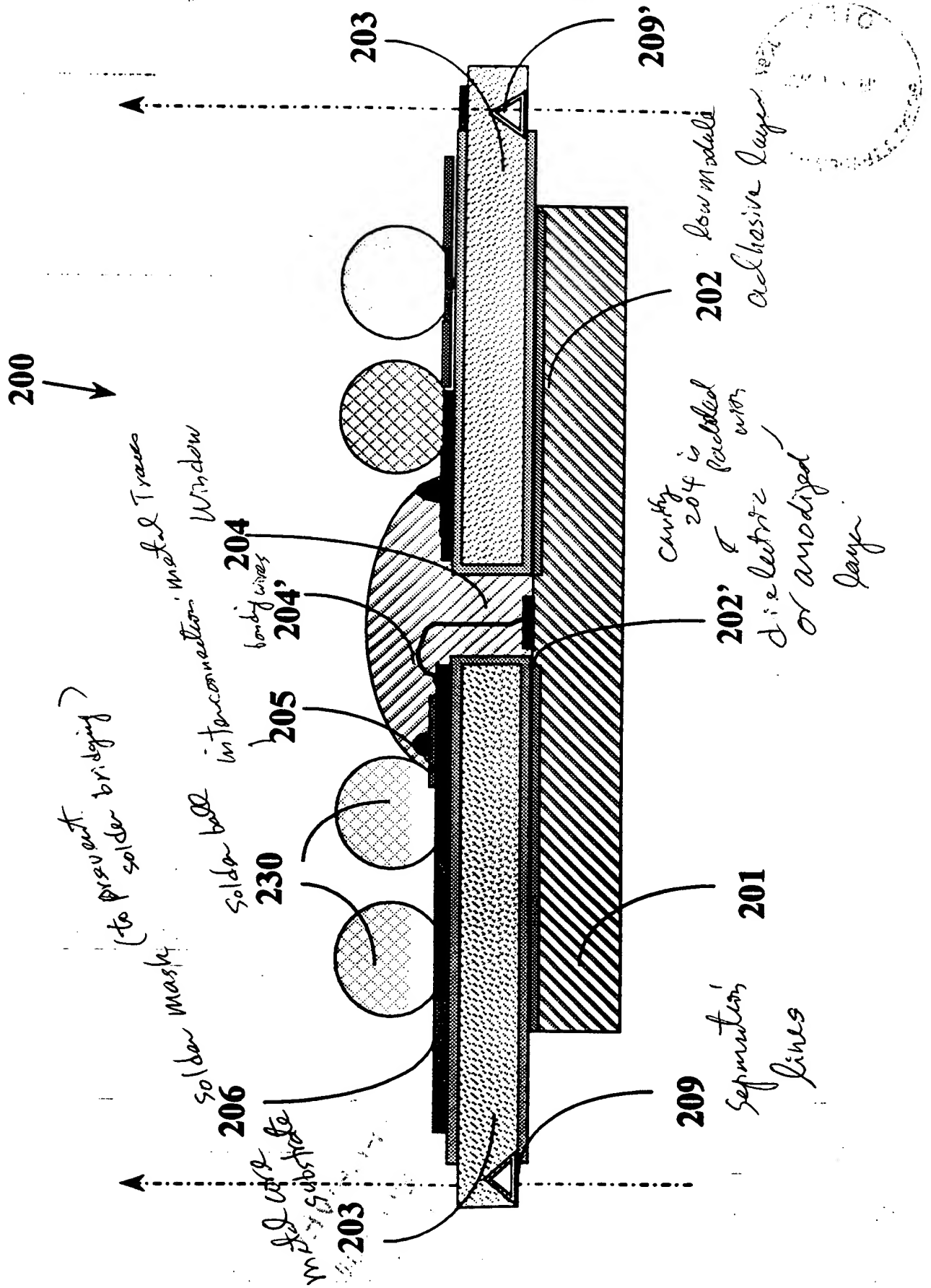


Fig. 2C

